DOCUMENT RESUME

ED 160 045 IR 005 996

AUTHOR	Smith, Jean McKernan; vonFeldt, James R.
TITLE	A Comparison of Two Media: An Examination of Computer Assisted and Videotaped Instruction in Teaching Diacritical Markings to Post Secondary Deaf Students.
INSTITUTION	National Technical Inst. for the Deaf, Rochester, N. Y.
PUB DATE	1 Aug 77
NOTE	16p.; For related document, see ED 153 642
EDRS PRICE	MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS	*Autoinstructional Aids; *Computer Assisted Instruction; *Deaf Education; Diacritical Marking; Field Studies; *Intermode Differences; *Media Research; Postsecondary Education; *Videotape Recordings
IDENTIFIERS	Webster Diacritical Markings Package

ABSTRACT

The computer assisted instruction (CAI) program "CAI Webdi," an instructional package for deaf education which utilizes CAI with audiovisual aids, was used in a comparative study of computer assisted and videotaped instruction. Based upon a formative evaluation of CAI Webdi with post secondary deaf students, an instructional television program was developed with CAI Webdi as a model consisting of seven videotapes, a teacher's manual, handbooks, tests, and test keys. The TV program was field tested in two ways: (1) as an instructional activity completed independent of classroom activity, (2) as an integrated classroom activity where students were provided basic CAI instruction in class and then viewed the TV program as an outside, supplementary activity in a self-instruction laboratory. Results indicated that the integrated CAI instruction version was more effective in subsequent learning than the independent lab version. However, such a conclusion must be cautiously drawn because of variables relating to review, retention, and difficulty in managing tape locations. (CMV)

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A Comparison of Two Media:

An Examination of Computer Assisted and Videotaped Instruction In Teaching Diacritical Markings to Post Secondary Deaf Students.

by

Jean McKernan Smith

James R. von Feldt

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August 1, 1977

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The Institute.

The National Technical Institute for the Deaf is one of nine colleges at Rochester Institute of Technology. NTID is unique in that it serves post high school deaf students from all states in the U.S., is federally funded by law and is focusing on high level career areas. The objectives of NTID are clearly defined and include development of individualized instructional components of curricula wherever possible.

The Authors.

Mrs. Jean McKernan Smith is a certified Speech Pathologist at the National Technical Institute for the Deaf involved in diagnostic evaluation, speech and voice therapy, classroom instruction, assisting in clinical research, and curriculum development. She has executed projects involving Computer Assisted Instruction of business-related vocabulary, formulation of a departmental handbook of policies and procedures, design of a brochure "Information for Instructors with Deaf Students in Their Classes," development of a curriculum in Idioms and Slang, and conversion of the Webdi program to a self-instruction format.

Dr. James R. von Feldt serves the National Technical Institute for the Deaf and Rochester Institute of Technology as a specialist coordinating CAI activities. He supports faculty CAI training through a specially designed training process (SKILL) which is instrumental in CAI course development, evaluation and research. He has designed and implemented new computer based instruction systems such as the CAI/TV system and has assisted many labs in implementing CAI to meet their needs.

Introduction.

Comparing the instructional effectiveness of two media such as Computer Assisted Instruction and Instructional Television is an extremely difficult task. Generally, there are so many variables that conclusions about the effectiveness cannot be made. However, a summary of data and observations resulting from activities designed to teach diacritical markings to deaf students can be made. A description of these activities and the evaluation of their comparative effectiveness is the purpose of this paper.

The data reported here were taken primarily from two previous NTID reports: "Description and Evaluation of the Webster's Diacritical Markings Computer Assisted Instruction Program", Joanne Subtelny and James R. von Feldt, 1975; and "Formative Evaluation: Webster's Diacritical Markings Package" (Instructional Television), William Clymer and Marsha Young, 1976.[1]

The English language presents major difficulties for deaf students in both the written and spoken form. The rules of grammar are difficult to learn and apply. Spellings often provide few clues to the pronunciation of words. The need to adopt and use a uniform system in presenting new words in writing as they sound is based upon the concept that a central problem in education of the deaf is language deficiency. Programs to teach diacritical markings, regardless of mode of instruction, are designed to: facilitate the learning of new words; and improve communication skills of deaf students by fostering competence in independent use of the dictionary.

The Webster diacritical system, adapted from A Merriam-Webster Dictionary, provides a discrete symbol for each sound and designates the appropriate syllable to be stressed in any polysyllabic word. The symbol system, therefore, presents cues for correct production, auditory discrimination, and visual recognition of new words in print and as visible speech gestures. By using the multi-sensory approach of presenting new words in print, in diacritical symbols, in spoken form, and within meaningful context, instructors can aid in reducing the language deficiency of deaf students and assist in reinforcing correct pronunciation, auditory discrimination and speechreading skills. Recognizing the benefits of such an approach and the necessity of possessing adequate diacritical skills, the Computer-Assisted Instruction (CAI) program was developed and termed "CAI Webdi".

Development and Description of CAI Webdi.

Two speech pathologists, instructors at the National Technical Institute for the Deaf (NTID), were provided training through the CAI SKILL Training Program.[2] As a result, they developed the Webdi instructional package, utilizing CAI with audio-visual cues. The content was organized in three parts to include all symbols for the vowels, diphthongs, and consonants c, ng, x and qu. The computer provided each student with instructions and related drill and practice according to individual needs.

Computer Assisted Instruction required student participation in the learning sequences. For this reason, it is referred to as "interactive" learning. CAI is designed to oversee the student as a surrogate of the teacher who designed the experience. This is done through tests and quizzes imbedded in the instructional program which are administered and graded by the computer. If a student does not attain criterion level (defined by the teacher), he/she returns to the specific section needed, for more practice until mastery is achieved. Thus, through analysis of student performance, the authors prescribe (through design) an individual program for each student. The interactive technique is very powerful, especially when combined with the diagnostic capacities of CAI.

Description of the CAI System.

The IBM 1130-1500 instructional system (designed in 1959 for research and development use) was used (Figure 1). Only one of the 10 learning stations was specially equipped for development of the course. The station had a television-like display, a keyboard to type in responses, a light pen to indicate answers, a random access audio unit to provide synchronous audio and visual input and to record student responses, a Warren amplification system, and a booklet with pictures specially keyed to the program.

IBM 1130-1500 CAI System
Learning Station

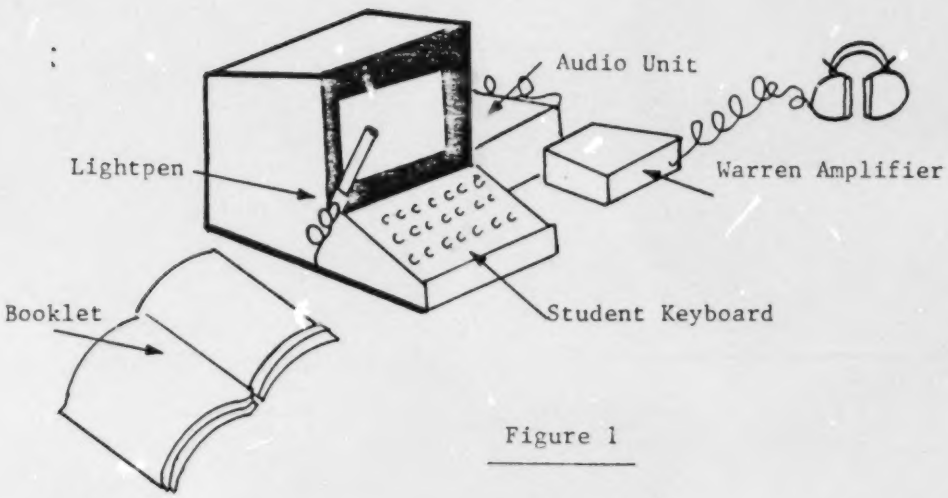


Figure 1

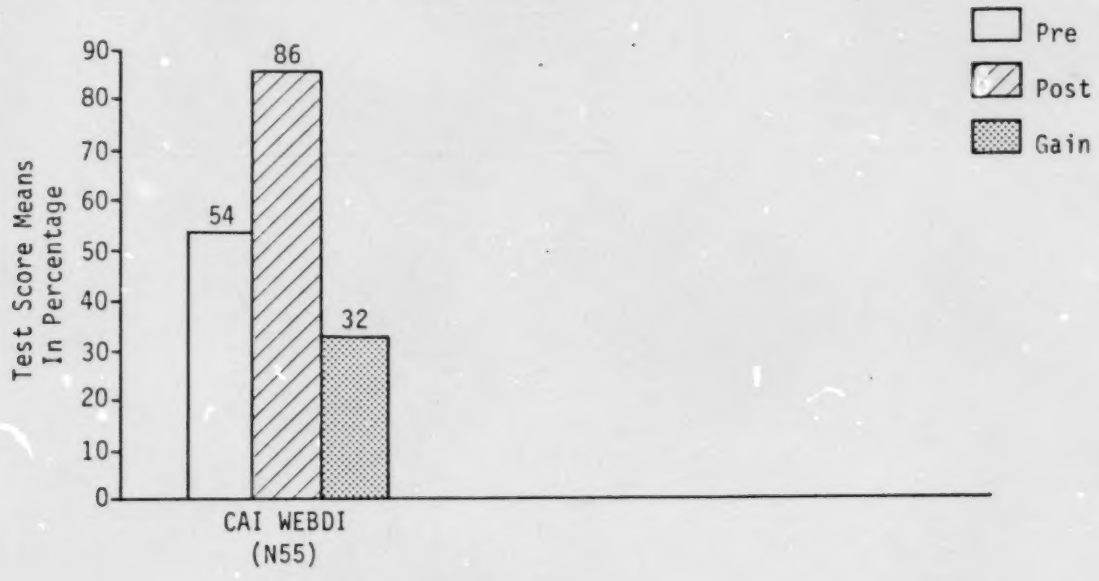
Administration of the Field Test (CAI Webdi).

The CAI Webdi was administered to 55 NTID students who had some discrimination for speech as determined by prior hearing testing. The CAI Webdi pre/post tests were administered in the CAI lab just before and just after the students went through the CAI program. The CAI proctor was available in the lab, but was not required, except to assist when a question or malfunction occurred.

Results.

The results of the computer assisted experience were measured by student performance and time required to complete the program. An analysis of the pre/post test scores showed improvement significant at the .01 level (t 21.15). As shown in Figure 2, the pre/ and post/test means were 54% and 86%, respectively.

Figure 2
CAI WEBDI: PRETEST, POSTEST AND GAINS



A large number of the students (87%) reached criterion level, specified as 80% or better. This is consistent with results of other CAI evaluations where the content is cognitive and requires much drill and practice.[3] The average completion time was 1.3 hours and was directly related to the amount of gain. Students pre/testing low required more time to reach criterion than students pre/testing high. Three factors appear to contribute to the positive results obtained. These include:

1) logical organization of content;
2) a design which called for evaluation and prescriptive drill and practice until the students reached acceptable levels;
3) the ability of the computer to present and analyze diagnostic and evaluative data; and
4) provide immediate feedback to the students.

Problems.

The primary problem in using CAI Webdi proved to be the audio unit. It frequently failed to position correctly and caused students to be signed off. The student would then have to sign-on again. Although students would re-start at the same place and would not lose any instruction, this situation proved frustrating.

Development of the Instructional Television Program.

In 1974, after the development and evaluation of the CAI Webdi program was concluded, the IBM CAI system was moved to a site a significant distance from the main academic building. This move, the inadequacy of the audio unit, and the construction of a Self-Instruction learning center within the Communication Division encouraged the development of a television version of the Webdi program. It was proposed that such a version would provide synchronous audio and motion characteristics, thereby increasing the dimensions of instruction to include speechreading.

In the development of the television version, CAI Webdi was used for a model; however, the diagnostic, prescriptive, interactive and feedback characteristics of CAI could not be provided in the same way.

The TV version consisted of 7 videotapes, a teacher manual, student handbooks, tests, and test keys developed by the Speech Department and the Division of Curriculum Development. The tapes included: (1) an

introductory tape; (2) five lesson tapes, each providing instruction for 4-5 diacriticals; and (3) a pre/post test presentation.

Administration of Field Test.

The Webdi TV Program was evaluated in two ways: first, as an instructional activity completed independent of classroom activities; and secondly, as an integrated classroom activity where students were provided basic instruction in class and then viewed the Webdi TV Program as outside, supplementary activity in the Self-Instruction Lab.

In the first field test, the Webdi TV Program was administered to 21 students enrolled in Pronunciation courses. The field test included the following activities:

1) administration of pre/tests via the Webdi TV Program;
2) viewing the program in the Self-Instructional Lab with each student manipulating the video player to provide repeated instruction as needed;
3) administration of written quizzes at the end of each instructional tape, with students directed to repeat instruction if the passing criteria (80% or better) was not achieved; and
4) administration of the post/test after successful completion of the last tape.

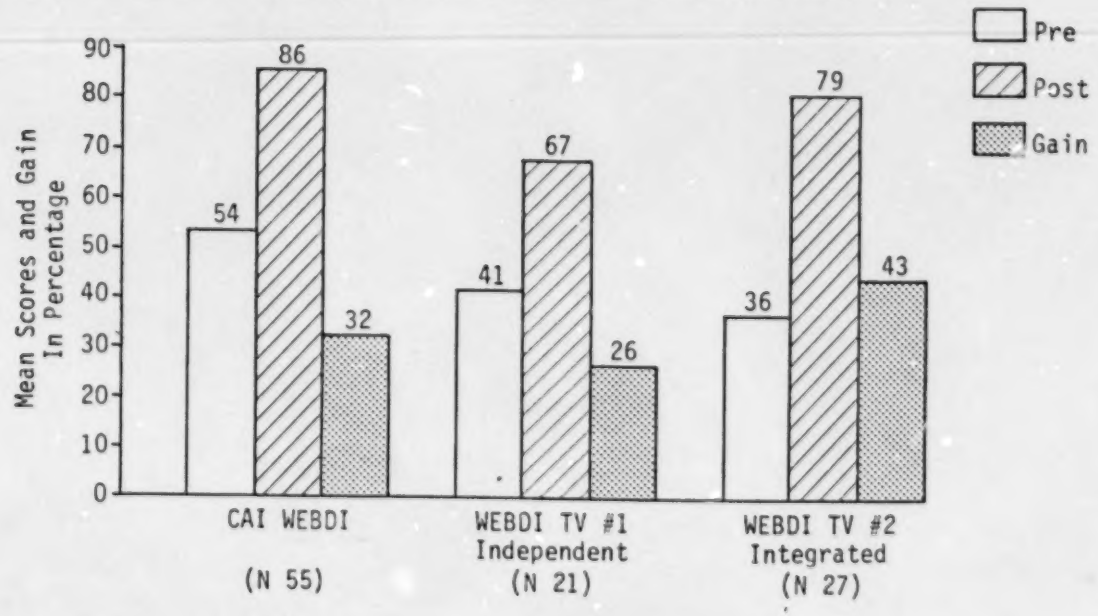
The second field test integrated the TV instructional sequences into the classroom activity within Pronunciation courses. To insure consistency in instructional procedures, a calendar of course activities

was developed and distributed to each of four speech pathologists involved in the evaluation. This calendar of activities provided for: (1) a pre/test administered via the Webdi program; (2) standard classroom procedure for teaching diacritical skills; (3) a second evaluation of diacritical skills; (4) use of the Webdi TV Program to supplement classroom activity; and (5) a post/test to determine overall improvements.

Results of the Television Field Tests #1 and #2.

Data graphed relative to percentage gain are shown in Figure 3 for all three versions of the Webdi Program.

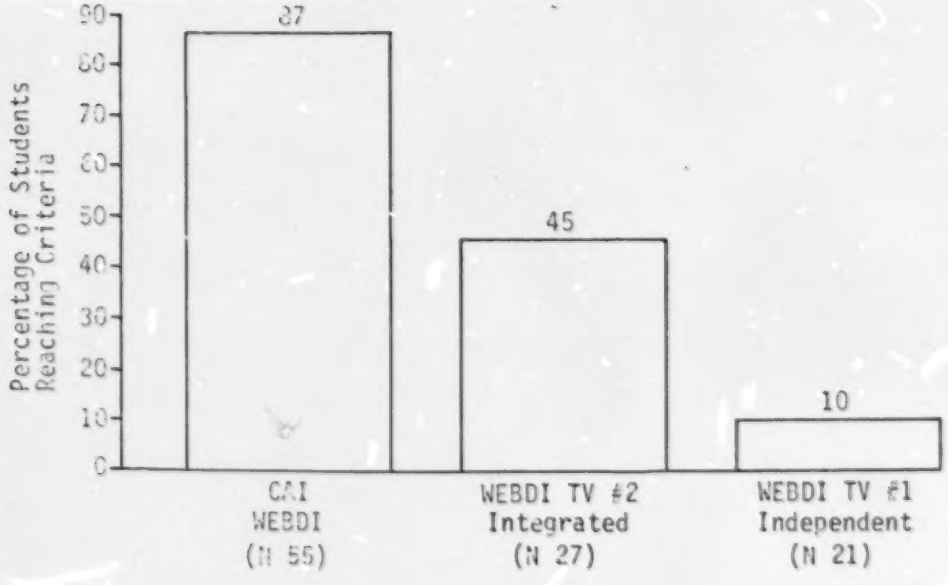
FIGURE 3
WEBDI PROGRAM: PRETEST, POSTEST AND GAINS BY MEDIA PRESENTATIONS



Analysis of the pre and post/test scores for the TV version indicate that gains were significant at the .01 level for both field tests (t 9.01 and 13.92). The post/test gains for TV Webdi #1 and #2 were 26% and 43% respectively. The pre/test data were similar for both TV groups, but the post/test data were not. The Television Test #2 (integrated approach) shows higher post/test scores than TV #1 (79% to 67% respectively). Notice, however, that both these scores are lower than the mean of 86% established for CAI Webdi.

The percentages of students reaching criterion level, specified as 80% correct or better, are compared for the three versions of the Webdi Program in Figure 4.

FIGURE 4
WEBDI PROGRAM: PERCENTAGE OF STUDENTS REACHING CRITERIA BY MEDIA PRESENTATIONS



As graphed, the CAI Webdi proved to be superior, with 87% of the students reaching criteria. Analogous percentages for TV #2 (the integrated version) and TV #1 (the independent version) were 45% and 10% respectively.

Summary of CAI Webdi #1 and #2 Data.

The following table presents pre/post test scores, percentage of students reaching mastery, time required and resources used to administer the three versions of the Webster's Diacritical Program.

SUMMARY DATA

	CAI	TV #1	TV #2
Pre/test mean	54.39%	41.00%	36.35%
Post/test mean	86.14%	66.52%	78.66%
Percentage Reaching Criteria	87.00%	10.00%	45.00%
Time on Program	1.32 hrs.	2.5 hrs.	2.5 hrs. *
Class Time	none	none	7.5 hrs.*
Teacher Time	none	.5 hrs.	7.5 hrs.**

* estimated as being equivalent to the time required for TV #1.

** estimated at nine 50-minute classes as reported.

The following results become apparent:

1) 87% of the students taking the CAI version reached criteria. The time required to complete the instruction averaged 1.3 hours, with no faculty time, class time or classroom space required.

2) The independent version of the TV Webdi Program #1 did not prove successful in bringing students to criteria level. Only 10% met criteria.

3) The TV Webdi Program integrated with class activity (TV #2) was more than 4 times as effective in bringing students to criteria level (45%); however, this version required both teacher and class time.

As indicated by this data, there is approximately a one-hour difference in time on program between the CAI and TV versions. It should be noted, however, that the time between pre/post tests was very different for the CAI and TV versions. In the CAI, post/testing usually occurred within one week of the beginning of the program. In some instances, the program was completed in one session. It should also be noted that a review was provided on the CAI version prior to completion of the program. Hence, in this situation, the post/test was assessing almost immediate recall of course content.

In both TV versions, the interval between pre and post/tests usually involved two to four weeks, and did not include provision for review. In this situation, the post/test results for the TV versions probably measure longer term retention of content than was assessed by the CAI Program. These two factors could explain the higher post/test scores resulting from the CAI Program. These scores may not be exclusively related to mode of presentation, but rather to differences in provision for drill and practice, review and differences in the time intervals between testing.

An additional factor which may have contributed to higher post/test scores for the CAI version may be related to student difficulties

in locating specific segments on the TV tapes. When quiz responses indicated a need for additional instruction, students had difficulty locating the specific instruction needed.

Conclusions.

The data indicate that cognitive skills were well taught by CAI in a short time without requiring teacher or student time in class. The computer-based, interactive, individualized strategy provided by this version is the most likely reason for its comparatively greater success. The independent version of TV Webdi (#1), which also did not require large amounts of teacher or class time, did not teach well. In comparing performance on the two TV Webdi versions, data indicate that the integrated version was significantly better than the independent lab version.

Although it would seem that computer-assisted instruction was the more appropriate media, such a conclusion must be cautiously drawn because of the variables mentioned relating to review, retention and difficulty in managing tape locations.

As was stated, comparing instructional effectiveness is an extremely difficult task. It would appear that combining the sound and motion of television with the interactive drill and practice of CAI would provide for greater gains in a shorter period of time. Such capability is projected for use at NTID in the form of a Computer-Assisted Instructional Television System prototype to be demonstrated late in 1977. Further information about CAI/TV can be obtained from Dr. von Feldt at NTID.

References

[1]National Technical Institute for the Deaf, Rochester Institute of Technology; 1 Lomb Memorial Drive, Rochester, NY 14623.

[2]von Feldt, James R. and Young, Marsha, "Project SKILL: Summer 1973, A Summary," November, 1973.

[3]von Feldt, James R., "An Overview of Computers In Education," Revised March, 1977.